

# POPULARISATION OF SCIENCE: HISTORICAL PERSPECTIVES AND PERMANENT DILEMMAS

Luisa Massarani and Ildeu de Castro Moreira

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*Popularisation of science, the beginnings of which coincide with the very process of creating and producing science, has answered to diverse motivations, contexts and interests. This article takes the view that historical analyses and comparisons can provide us with an interesting look at current practices of science popularisation and the challenges we face.*

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*La divulgación científica, cuyo inicio coincide con el del propio proceso de creación y producción de la ciencia, ha respondido en su evolución a motivaciones, contextos e intereses diversos. Este artículo propone una mirada sobre este proceso histórico, que nos permite discernir algunas de las principales mutaciones a las cuales esta actividad ha sido sometida, así como una nueva percepción de los desafíos que enfrenta.*

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Since the 1980s, there has been a considerable boom in science popularisation at international level. This, however, is not a recent initiative. The story of this activity begins many centuries ago, with the very process of creating and producing science. The study of its historical aspects can help us to see how its forms change in accordance with philosophical suppositions concerning science, the scientific contents involved, the underlying culture, the political and economic interests and the media available in different times and places. Moreover, characteristic aspects of scientific activity can be seen which possess a high level of permanence over time and which appear as challenges which survive the passing of time.

The history of the popularisation of science is «an indispensable complement to the history and philosophy of the sciences, insofar as it gives rise to new questions: why, for whom and how a science, at a particular time, was spread through the social fabric of an era; who made this science theirs in a particular era and by what means?» (Raichvarg and Jacques, 1991). However, historical studies of these activities in different contexts are still infrequent, particularly from a comparative standpoint and outside the developed nations. An analysis of this kind could lead to interesting reflections on the

current dilemmas facing the popularisation of science, as well as facilitating the outlining of new strategies for dealing with some of them.

The traditional treatment of science popularisation makes a net separation between the producers of knowledge and its «consumers». This is related to a unidirectional view of the activity: from gifted individuals to masses lacking in knowledge. The analysis of the diffuse boundary and of the interrelations between these categories has only been taken into consideration recently. Furthermore, the world is not homogeneous; it is made up of a great diversity of cultures. Context and attitudes are important for analysing how the assimilation of knowledge takes place among different peoples. In this article, we attempt to discern some of the principal mutations popularisation has undergone in terms of the forms it has taken in different contexts and eras, the different actors and professionals who perform it and the role played by the public.

## Popularisation of science and the diversity of contexts

If we take the scientific revolution of the 17<sup>th</sup> century as the start of systematised scientific activities, we can see Galileo working hard to communicate the new

discoveries in physics and astronomy. With him, the job took the form of advertising and spreading new methods and ways of thinking and experimenting. The social distinction between science and public began with the formation of the scientific community and the institutionalisation of science as an activity with rules and practitioners different from other activities.

In the 18<sup>th</sup> century, science also became a source of interest and amusement for the aristocracy and the middle classes in Europe. The publication of books aimed at explaining Newtonian physics, experimental demonstrations of electricity, natural history societies, all indicate the growing interest of an expanding audience. With the French Revolution, the inhabitants of towns were elevated to the category of citizens and the enlightenment transformed science into a powerful political tool. Furthermore, the expeditions of naturalists from the most developed European countries to different parts of the world played an important role in incorporating knowledge produced in other cultures. The botanic gardens created in this era were not only repositories for exotic collections, they were also centres of economic interest in the context of an exploratory science. There is a little-studied aspect of this process –the transmission and absorption of knowledge in the opposite direction to the usual: from the natives to the naturalists. The popularisation of science had a tentative beginning in several coun-

tries of Latin America and Asia in the 18<sup>th</sup> century, when local intellectuals became convinced that science would raise the economic level of their countries. Periodicals and journals were created as a vehicle for the dissemination and discussion of enlightened science. Nevertheless, the popularisation initiatives were still disperse, almost always characterised by poor institutional acceptance and a very short reach in terms of the general public.

The creation of the Royal Institution was to define a new framework for the activities of science popularisation. Different scientists and organisations promoted public demonstrations, popular conferences, publication of books and journals dedicated to popularising science. One of the aims was to increase the interest in science among the working classes. Whereas in the 17<sup>th</sup> century, the popularisation of science exalted the work of the Creator, in the 18<sup>th</sup> century, great effort was made to attract the masses with the marvels of science and it was hoped that this would become a source of moral uplifting and political conformity.

In the second half of the 19<sup>th</sup> century, popularisation activity intensified throughout the world. The planet was overrun by wave of optimism for the benefits of scientific and technical advances, expressed through the production of the great Universal Exhibitions and national exhibitions, even in the so-called Third World. The fundamental characteristic of the science popularisa-

### **Luisa Massarani**

[see «*Who is who*», page 94]

### **Ildéu de Castro Moreira**

Physicist and science historian. He holds a doctorate from the Universidade Federal do Rio de Janeiro (UFRJ), he works in this Brazilian university at the Physics Institute and on the Interdisciplinary Group of Epistemology and History of Science and Technology. He collaborates with Casa da Ciencia, the Cultural Centre for Science and Technology at the UFRJ.

tion carried out was the idea of applying science to industry. In the US, well-known men of science devoted themselves to disseminating scientific knowledge in the hope of contributing to the development of the emerging industrial economy. In many dependent countries, such as India (Sangwan, 2000), there emerged a process of «vernacularisation», whereby local popularisers translated foreign texts and produced regional periodicals in the local language.

The influence European countries had over their colonies was reflected in the science which was disseminated and produced in each one of them. Popularisation of science was often carried out by scientists who had studied in European countries and tried to reproduce external models. In some cases, transatlantic science-communication networks acted as mechanisms for transferring scientific ideas and values (López, 1997). At this time, Europe was seeing the appearance of the first professional popularisers, whereas in Latin America, the main popularisers were men associated with science through their professions, as in the case of teachers, engineers and doctors, or through their scientific activities, as in the case of naturalists.

Following World War II, a new kind of science popularisation emerged throughout the world. Scientists such as Albert Einstein and Marie Curie acquired a notable public image; they themselves realised in the importance of scientific education and the popularisation of science. The defence of «pure science» is one of the main characteristics of the popularisation of the time. New media, such as radio and cinema began to be explored in the diffusion of culture and science and the first interactive science museums appeared in Europe. In some Latin-American countries such as Argentina and Brazil, local scientific communities and traditions began to form, associated with the movement to value basic research, facilitating and increasing dissemination of science. In the Soviet Union, under the Communist flag, the development of science and technology, as well as a wide diffusion of knowledge became the planned actions of a centralised state.

In the period immediately following World War II, in the context of the applications of nuclear energy and the construction of man-made satellites, and under the

influence of the transformations which took place in science education in the US, a wider movement began, based on the importance of science and experimentation. Its consequences included the appearance of science centres and museums with hands-on characteristics. The advent of television introduced a powerful communication tool, but exploration of its uses in popularising science was almost exclusively limited to the developed world. A significant expansion in actions related to the popularisation of science at international level was to take place once again in the 1980s.

Analysis of the evolution of science-popularisation activities shows phases of different intensity, whose aims and characteristics reflect the context and interests of each era. These stages generated contemporary movements in Europe and other parts of the world – at different times and with different intensities and repercussions – indicating that the globalising characteristics of science are present and are reflected in local events (Bauer 1998; Moreira and Massarani, 2002). In order to understand the reasons for this more or less cyclical behaviour, it is important to consider both factors associated with the production processes of science and internal socio-economic factors.

## The actors of popularisation

Scientists, of course, were and still are some of the main actors in the popularisation of science. Analysis of the popularisation work carried out by them makes it possible to identify a large variety of motivations, attitudes and intentions behind their forays into this field. Even the great scientists, such as Galileo, Euler, Faraday, Wallace and Einstein carried out some activity or produced texts for the popularisation of science. Currently there is a broad range of scientists who devote themselves to writing for the general public on subjects in their areas. We can even talk about science popularisation or popular science as a literary genre.

In Latin America, it was the scientists who committed themselves to the popularisation movement from the 19<sup>th</sup> century: «through their popularisation activities, they attempted to increase their social presence with different aims: reaffirming their professional legitimacy,

increasing communication with their colleagues and with other social groups, strengthening their ties with the institutions which controlled the different powers. But in many of these popularisers –most of them belonging to the technical-scientific elite– we find a double motivation of a political-ideological nature which encourages and guides their cultural action» (López, 1997).

In Europe, the professional science popularisers can be identified from the 19<sup>th</sup> century. There are many examples, such as Figuiet and Flammarion in France. With regard to science journalism, an important stage in professionalisation takes place in the early 20<sup>th</sup> century in the US, with the Science Server, a science news agency produced by and for science journalists (Gregory and Miller 1998). However, in many countries, the professionalisation of popularisers is very recent. Only in recent decades have efforts been made more focussed on better professional training of these actors. They are becoming increasingly diversified as a consequence of the diversity of instruments and the greater public space the activity has managed to attain with the growing importance of science and technology.

### The role of the public

The relationship between science and the public has undergone profound changes over the centuries. In the 17<sup>th</sup> and 18<sup>th</sup> centuries, the public played an important role in legitimising science itself. The experimental philosophers assigned the general public the role of non-specialised witnesses to experimentation: «experimental science, at its inception, required and presupposed, in order simply to exist and be accepted, the presence of a group of witnesses» (Féher, 1990). Afterwards, the presence of the public witness was replaced by the publication of science articles in specialised periodicals which, in cognitive terms, are only available to other specialists, since they are written in language which presupposes prior knowledge. With this, we see the progressive mutual isolation of science and the public, although the role of amateurs was significant in the production of science in the natural sciences.

In the 20<sup>th</sup> century, the role of the public in the diffusion of science has been reduced in other aspects.

Although the so-called «deficit model» has been much criticised in the past decade, there still persists the vision of the public as a homogeneous mass which participates merely as a receptacle for the initiatives of science popularisation. Other approaches, of a contextual nature, seek to take into account the particular circumstances of the audience, their knowledge, beliefs and attitudes. The communication of science is seen as a process of dynamic exchange: it is a two-way process where the knowledge, requirements, desires and expectations of the public must be taken into consideration.

Attitudes, participation and any reactions of the public to actions involving science and technology have, in general, been poorly studied, from the point of view of both the history of science and the sociology of science. In Europe and the US, some studies have given their attention to these processes (Irwin and Wynne, 1996). Facts which highlight the complexity of the relationships between science and culture, beliefs and political and scientific conceptions are, for example, the occurrence of popular revolts that reflect tensions between the public and the uses of science. In Brazil, a typical case was the *Vaccine Revolt* of 1904, a violent response to the obligatory vaccination defended by scientists. A similar event was recorded in the 19<sup>th</sup> century with the *Rompe-Quilos*, movement against the forced adoption of the decimal metric system. A contemporary event involving conflicts of this nature is the attempt to introduce transgenic foods, which get different receptions in different countries.

### Final considerations

Currently, it is possible to discern some changes on the stage of science popularisation. As a result of the social demands which characterise democratic societies regarding the uses of science and technology and their growing importance for humankind, new doors are opening onto a definition of science popularisation which is less mystifying and more critical of science. From this perspective, there is a more important role to be played by questions inherent to the process, such as the functioning of the scientific apparatus, the uncertainties, the risks and the ethical questions. In a sense,

the public, who have been progressively isolated from the science arena since the 17<sup>th</sup> century are returning to play an important role. From this panorama also emerges the importance, especially for many developing nations, of respecting and valuing native knowledge.

In the process of historical variation of different aspects of the popularisation of science, some questions are permanent. When we reflect on these activities, the questions of Raichvarg and Jacques are always present. Evidently, the perennial challenge of the popularisation of science refers to its conceptual core: How to share appropriately with general and diverse audiences knowledge built from highly specialised methods and practices? As we have seen, conceptual models and tools change over time. A look at the predominant strategies in the museums of the 20<sup>th</sup> century provides evidence for the situation: emphasis was lifted from the passive exhibition of wonders and moved to the importance of doing and experimenting (*hands on*). Later, the impor-

tance of reflection (*minds on*) was highlighted, immediately followed by the incorporation of emotions (*hearts on*); more recently, we can talk about «*context on*» and «*risks on*». Another «...*on*» will surely appear, if history is anything to go by.

The popularisation of science is an activity in a permanent process of (re)construction. Assessing its current meaning, discussing its aims and practices, striving to make it more effective and integrated in the social reality of each country and region, exploring new media, themes and focuses are only some of the challenges that face us. Expanding it to include large marginalized sectors of the population is another task which will only be possible if we have consistent general orientations. Popularisation of science should include a sufficiently broad collective process which involves research institutions, universities, governments and the actors who weave these threads together: scientists, communicators, journalists, researchers and students. ¶

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